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EDITORIAL NOTES.

THE Scovill and Adams Company of New York has sent us a neatly got up brochure entitled "The half-tone process with the Hago Screen and plate holder and diaphragm system." Those who have taken any interest in the half-tone process of reproducing photographs will remember how controversy has raged over the question of diaphragms, their size and shape, and over the question of the best screen and distance. The Hago screen-holder and Hago screens and diaphragms are designed so as to make it possible to adjust the screen at all required distances from and parallel to the plate, and to supply a series of diaphragms suited for all subjects. It seems improbable that any of our members have devoted themselves to half-tone work but if they have it would be worth their while to go carefully into the merits of this system.

MR. GEORGE W. TOTTEM, in *The British Journal of Photography*, gives an account of his method of mounting photographs which is probably new to many. "We all know," he writes, "that amateurs as a rule get tied into knots when they start putting a 'mountant' on their prints, and they fall back on to those slip-shod things, 'slip mounts'. Now being a dealer, I ought to say nothing about them; but as I *do object* very strongly, I don't mind saying so. Consequently I demonstrate my method of mounting several times a day throughout the week. This is the scheme. I take a large glass (cutting shape, say), spread mountant, lay print down, rub well into contact, peel off, lay on mount and rub well down, which is as simple and quick in practice as it is to write. The advantages are that ones fingers do not get messed up, only enough mountant is left on print to make it adhere to card, no dirty edges, no finger marks on face, &c., in the case of

glazed prints, no backing." The method described is more elegant than the language in which it is described.

WRITING in the *Chemical News* Dr. J. H. Vincent gives an account of some interesting experiments which he has made on the production of effects on photographic plates in the dark, similar to those which have been so fully dealt with by Dr. Russell. Dr. Russell, as will be remembered, finally came to the conclusion that the effects he was dealing with were produced by the action of small quantities of hydrogen peroxide. Now ozone has in many of its effects strong resemblance to hydrogen peroxide since both readily part with some of their oxygen, but by their action on photographic plates they can be readily distinguished, since ozone *alone* has been shown to have no action. Dr. Vincent, however, has shown that if india-rubber, itself quite inactive, is present near the plate ozone will produce the effects dealt with by Dr. Russell. In fact so sensitive are the plates to this action that it may be used as a delicate test for the presence of ozone. Other bodies which have been tested and produce the same effect as india-rubber are gutta percha and camphor. It seems probable from Dr. Vincent's experiments that ozone acting on india-rubber produces hydrogen peroxide and that this, as in Dr. Russell's experiments is really the active agent. It is possible that the reaction dealt with might be used as a more satisfactory measure of the amount of ozone present in the atmosphere than any of the methods that have hitherto been employed.

MR. C. H. BOTHAMLEY contributes to *Photographic Scraps* an interesting note on the new Ilford "Platona Paper," which we summarise. The paper is coated with a mixture of a ferric salt and a platinum salt and the sensitized surface has a bright lemon yellow colour which, during exposure, changes to a dark purple-violet, and ultimately to dark orange when the maximum possible effect of light has been produced. The image on a properly exposed but undeveloped print is not very deep or distinct. It should, however, show all the details in the shadows and the main details in the half-tones but not the details in the lights. Care must be taken to examine the print in weak light only.

AFTER exposure the prints are developed by immersion in, or floating them on a solution of potassium oxalate and phosphate. The following formula answers well—

Potassium oxalate	2 ounces.
Potassium phosphate	½ "
Water	14 "

The solution is best made with hot water and will keep indefinitely. For use this stock solution should be diluted with an equal quantity of water. When development is complete the prints must *not* be washed with water but must be placed directly in the clearing solution made up as follows—

Pure hydrochloric acid	1 ounce.
Water	80 ounces.

Three dishes should be used as for other platinum papers and the prints moved about in each for about 5 minutes. After this they should be washed in water for about 15 minutes.

AS is the case with other platinum papers damp must be carefully avoided. The pads and printing frames, must be dry, and it is well to place some waterproof material between the pad and the paper. The paper is sent out in tins fitted with a screw lid and india-rubber washer which forms an air-tight joint and each tin contains a lump of calcium chloride. Like all platinum papers the best results can be got only from good negatives which show good contrasts and considerable details in the shadows. Negatives that give first class prints on P. O. P. will also yield first class prints on Platona paper, while negatives which are very strong in contrasts will give better results on Platona than on P. O. P.

WE congratulate Major Van-Geyzel on his admission as a fellow of the Royal Photographic Society. We trust he will soon return to Madras with his health fully restored.

THOSE of our readers who use a metol developer might try the effect of making up the solution with lime water instead of ordinary water. Dr. Haschek states that the use of this gives a developer which is much slower in

action but produces much more brilliant negatives and negatives which lose less in the fixing bath.

WRITING of the new developer Adurol—the chloride and bromide substitute of hydroquinone—Dr. A. Bogisch says that its most important property "is its power to give density, which is not attained even by hydroquinone and caustic alkali. It is not what one would call a rapid developer . . . . but works free from fog until development is completed, which is not the feature of hydroquinone and caustic alkali."

HE recommends the following formula, which differ somewhat from those which we quoted on p. 59 :—

I.—Adurol-Potash Developer

A.	Adurol	25 grammes or	80 grains.
	Sodium sulphite (cryst.)	200 „	„ 640 „
	Water	1500 ccm.	„ 10 oz.
B.	Potash carbonate ...	100 grammes „	1 oz.
	Potassium bromide ...	2½ „	„ 12 grains.
	Water	1000 ccm.	„ 10 oz.

II.—Adurol-Soda Developer

A.	As above		
B.	Sodium carbonate (cryst.) ...	350 grammes or	3½ oz.
	Potassium bromide	2½ „	„ 12 grains.
	Water	1000 ccm.	„ 10 oz.

With clear working negatives the bromide may be left out. For studio work take 3 parts A, 2 parts B. For landscapes and snap-shots take 3 parts A, 2 parts B and 2 parts water.

Bromide paper may be developed with 3 parts A, 2 parts B and 5 parts water.

ON MAKING A FOCUSSING SCALE FOR A HAND CAMERA.

THE owner of a hand-camera who changes his lens necessarily finds that a new focussing scale is required, whilst one is often useful even on a stand camera. I had occasion to make such a scale the other day and information as to how it is done may be of interest to some members of the society. There is nothing difficult, or recondite, about the operation, merely a little arithmetic based on a formula to be found in every text book of photographic optics.

The first requisite is the equivalent focus of the lens, which should have been ascertained by the maker and marked on the mount. If not marked, or known, it must be ascertained and I decline to commit myself as to how this had better be done. The simplest method, to obtain an equal sized image of an object and divide the distance between the object and the screen by 4, though recommended by J. H. Dallmeyer, is very emphatically condemned by J. Traill Taylor. There is the further disadvantage that few hand-cameras give the necessary extension. For other methods, any one interested can read a correspondence on the subject between "J. F. T." and T. R. Dallmeyer in "The British Journal of Photography" for February and March this year, pp. 85, 116, 142, 157 and 190.

Possibly the Editor of this Journal will favour members with a note as to the best and most convenient way of ascertaining the equivalent focus.*

In my case I was saved the difficulty, as the lens for which I had to make a scale is a Cooke and marked, as all lenses made by Taylor, Taylor and Hobson are, with the equivalent focus, which in this instance is 6·05 inches.

The formula used was

$$f = \frac{p\,F}{F - p}$$

Here

p = principal, or equivalent focus of the lens, = 6·05 inches.

f = lesser conjugate focus, or distance of the optical centre of the lens from the focussing screen, when focussed on a given object. This is the quantity which it is desired to ascertain.

F = the greater conjugate focus or the distance of the given object from the optical centre of the lens. To correspond with the other factors this must, in this case, be expressed in inches.

The scale was made from 40 ft. to 2 ft. thus:—

40. $$\frac{6{\cdot}05 \times 480}{480 - 6{\cdot}05 = 473{\cdot}95} = 6{\cdot}13 \text{ inches.}$$

30. $$\frac{6{\cdot}05 \times 360}{360 - 6{\cdot}05 = 353{\cdot}95} = 6{\cdot}15 \text{ inches.}$$

and so on to

2. $$\frac{6{\cdot}05 \times 24}{24 - 6{\cdot}05 = 17{\cdot}95} = 8{\cdot}09 \text{ inches.}$$

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* For our own part we wish nothing better than Dallmeyer's method as described on p. 63 of this volume.—(*Ed.*)

These distances were set off with a pair of dividers on a strip of white celluloid and the scale scratched and inked in. Infinite distance, or the zero of the scale was, of course, a line at 6·05 at one end of the strip.

The camera was then focussed on a very distant object, the zero line adjusted to the pointer and the scale secured to the camera by small screws.

J. W. C.

OUR HOME LETTER.

June 1899.

With a blazing sun and cloudless, azure sky, conditions which have lately prevailed, it seems inappropriate to talk of news, notes on chemical manipulations, and that sort of thing, but more suitable to speak of holidays with the camera, of shingly beaches, shady woods, flowery meadows, or the everlasting hills.

A brief sojourn in the country fell to my lot a few days ago. I did not seek the busy bromenade, or patronise the giddy char-à-banc, but hied me to a secluded spot among the Cumberland hills, to emulate the shepherd lord of Skipton whose

"........daily teachers had been woods and rills;
The silence that is in the starry sky,
The sleep that is among the lonely hills."

I wandered in the woods, surveyed the prospect from little rocky heights, and brought my camera into use when mature selection had determined upon a composition. Of subjects there were plenty, varied enough, so far as landscape was concerned, to satisfy the most exacting. But I had little success in figure work, having failed to meet with any suitable people. The Cumberland folk, as a class, are inclined to sharpness and hard features, their clothes are not to be mentioned alongside the Normandy peasant, for example, or the Norwegian countryman, though occasionally the right type can be seen. However, the variety in landscape was endless. I made a few pictures of the panoramic order; prospects of hill and dale, choosing some well-marked object in the foreground to give full effect to the distance. For these a small aperture and a very brief exposure were essential.

As for the country in detail, I followed up several lines of interest, streams, for example. Some have rocky channels, water-worn and carved into deep basins: others strewn with huge boulders, the detritus from an old glacier; others jagged with slaty rock, producing cascades; while a fourth kind are flat and pebbly in character, marking the passage of the stream across an alluvial flat. In all such subjects it is most difficult to render correctly in the photograph both dark rock and rippling water, since the former becomes reproduced darker than the original, and the latter lighter, because of the amount of reflected light. One may do a little in development towards correcting this inequality by applying dilute potassium bromide locally, but the proceeding is somewhat dangerous, and not one which can be recommended except to a skilful manipulator.

I was also much interested in the "hows," or little rocky eminences, which are quite a conspicuous feature of the district. Their origin is likewise due to glacial action. Geologists tell us that the glacier in its course swept away all but the hardest and most resisting rock masses, and in flowing over those it rounded their tops, making them look like sheep's backs. Hence the name of *roches moutonnées*, which has been applied to them in Switzerland. There are all sorts and conditions of hows, from the gracefully-rounded to irregular jagged, from bare-backed rock to hills rich with verdure and studdied with trees, from tiny bosses a few yards in diameter to larger eminences more than a quarter of a mile in circumference. I photographed them in early morning or late evening, when their shadows stretched far into adjacent fields.

Though the camera was seldom left in the house, I did not give up the whole of my time to photography. Bathing proved a very seductive pastime, especially as performed in one of the delightful rock pools to which allusion has been made. Sea-water may be buoyant, but for sweetness, clearness, and limpidity give me a quick-flowing, sparkling lake country rivulet, and I shall neither envy Adam in the Garden of Eden nor an Eastern potentate his luxuriant rose-water immersion. Although bathing is a blessing to man, for photographic instruments it is scarcely advisable and when, through a little carelessness in handling, my camera narrowly escaped falling into one of the aforesaid rock pools, a cold perspiration swept over me at the bare prospect of losing, even for a time, so congenial a companion. I caught it in the nick of time. Half a second later, and the best that ten guineas could purchase would have had to be finished up from the shingly bottom of a basin three feet deep.

With old Sol shining down so fiercely I felt a little afraid of fogging plates in the field. A large black focussing cloth served well to keep over the camera at the moment of drawing the slide and exposing, and I gave my slides very little opportunity of absorbing stray beams of light, but put them under cover at all times save just when any one of them was wanted.

I must confess that I had one or two fogged plates, and though not quite certain as to the reason of this defect, I quite think that it most likely occurred in the camera. During sunny weather when the atmosphere is so clear, it is essential to guard carefully against any possibility of leakage in either dark room or camera. Cameras should be occasionally tested and the interior painted with dead black. The dark room also ought to be examined for cracks and

crevices which the dryness of the atmosphere may cause to open out in unexpected corners. After all, the weather was a shade too fine and the skies more brilliant than desirable. My prints show marked contrasts, too marked indeed for the best work, and fail to convey that sense of distance which is essential in pictorial landscape. A few light fleecy clouds, and perfect stillness, with the sun partially obscured, represents my notion of perfect conditions.

As though to compensate for the want of figures, an old jackdaw, blind of one eye, haunted the house where I stayed. Upon him I wasted quite a number of plates before ariving at any satisfactory portrait, for although tame enough, like the 'eathen in 'is blindness, he obeyed no orders except his own, and flew off or assumed an awkward posture at the critical moment. I got him at last, on a quarter-plate, perched on the back of a rustic seat, with quite a natural expression in his remaining visual organ.

I have almost thrown over plates in favour of films, and believe that the proportion of photographers who are so doing is very rapidly increasing. Many of the disadvantages under which films laboured when first produced have been removed of late years by improvements in the manufacture of celluloid. It is true that the roller film has its curling propensities—particularly annoying in development and printing—but this accusation cannot be made in the case of the flat film. That, however, has one drawback, the only one in my opinion preventing its universal adoption—the price—about half as much more than glass plates. Let manufacturers bring films down to the price of plates, and the consumption of glass for this purpose will collapse like an empty balloon. Rumours are in the air of a new cheap film. I am quite sure that the man who is first in the field with low priced films will reap a golden harvest.

PERCY LUND.

EXTRACTS.

Drying Negatives, Films and Prints.

By G. E. Brown, F.C.S., F.I.C.

Before setting to dry, the surface water should always be gently mopped off the negative with a soft handkerchief. This is particularly necessary when the wash water is very hard.

There's many a slip betwixt the washing tank and the printing frame. One of the chief causes of these deplorable misadventures is the rack on which the tyro essays to dry, say, half a dozen negatives. There is something very touching in the faith with which the information in the dealer's catalogue, that this is the best thing for the purpose, is received, for the negative rack is indeed a vain thing, and for this reason — I state but eht facts.

You put your negatives on the rack to dry, and in the fullness of time you return to find that a space all round of about half an inch in breadth has dried. Then you remove those negatives from the rack and place them upon the mantlepiece. Results: (1) a dark central patch where the the film has dried quickly, (2) another letter to a worried editor.

Negative rack are all very well if you only insert one-half or one-third the number of plates which they are built to take. Even then the films dry much slower than if you expose them more freely to the air which is to rob them of their moisture.

One of the best means of thus exposing them is almost as old as photography itself. Drive into your dark room wall—or, if this is debarred, into a big board that you can rear up somewhere—a series of pairs of iron brads at a distance apart about equal to the shorter side of the negative. On these nails the negatives are placed to dry films outwards, if rapidity of drying is the first consideration; films inwards, if freedom from dust is considered more important. The only thing to be said against this method is that a shock may throw them to the ground. A quiet corner should be devoted to the purpose.

The rapidity of drying depends on the temperature of the room and the current of air to which the plate is exposed.

It goes without saying that if the plates be arranged at a good height from the ground, and an oil stove (with a brick on it to diffuse the heat) placed below near the wall, drying will be considerably quickened. There is, as the reader no doubt knows, a neat little drying rack on the market in which the plates are subjected to a current of air warned by a series of tiny gas jets.

Another form of rack, of which as many as need be can be made in a few minutes, is the suggestion of an *A.P.* correspondent a year or so ago. Simply cut slots in the sides of a plate box (or cover), and, placing the plates in these slots, their own weight will keep them in position.

Plates—and especially lantern plates—must, of course, be protected from dust whilst crying. A drying cupboard is always a convenience and a necessity if trouble is met with in the shape of dust. It need not be at all an expensive item if for drying negatives only, and not sensitive plates. Get a good sized box, such as a Tate's sugar box, and remove one end. Cut a circular hole about three inches diameter in this and the other end of the box. Fix the loose end about two inches further in the box, so that it forms a kind of false bottom when the box is stood on end. Nail a piece of tin plate over the end of the box and fill the space between this and the false bottom with asbestos or any material—metal turnings, etc.—which shall expose a large surface to the incoming air. Nail a strip of perforated zinc over the front of this bottom chamber, and a piece of muslin over the circular hole in the bottom of the box. Attach the lid of the box as a hinged or sliding door, and screw four legs to the sides to raise it eighteen inches from the ground. The aperture in the top has a length of stove piping screwed down over it by a flange. A small oil stove placed underneath the box warms the air passing through the bottom chamber and causes a constant current of warm air through the box. The plates are placed on nails round the sides, as mentioned above, or on negative racks

A dying-cupboard, which does not require artificial means to supply the change of air necessary when plates are dried in a closed space, is on the market, and consists of a metal frame covered with gauze or muslin, in which racks bearing the negatives are fixed. If the cage be placed near an open window, or anywhere where there is

a good draught, the negatives dry fairly rapidly, and dust—that enemy of spotless skies in lantern slides—is excluded.

The methods of drying by purely artificial means were fully dealt with in the *A. P.* of February 10th, 1899, and I will therefore merely mention them: (1) Hardening the film with formalin, and drying before the fire. (2) Removing superfluous water by gently pressing cambric or fluffless blotting-paper on film side with a roller squeegee, and drying at very gentle heat. (3) With methylated spirit.

To many the drying of rollable films presents difficulties from the curling and buckling of the film. Some—the thinner—are more liable to curl than others. One or two simple modes of drying them may be mentioned. It will be found that the film shows much less tendency to curl if it be dried in contact with a sheet of glass, than if merely pinned up by the corners. Lay the wet film, plain side down, on the glass, and allow it to dry just like a plate. Others find that if laid on an inclined board covered with blotting-paper, the films will dry with scarcely any curling. If they do curl they can be very easily straightened by rolling round a cardboard tube—when perfectly dry—leaving there all night and then putting under pressure (in a big book) for some hours. They will then store quite flat in envelopes.

These methods are better than soaking the films in water containing glycerine, which, whilst it leaves them limp, keeps them hygroscopic.

Passing to the drying of P. O. P., bromide, and other prints, on removal from the wash water all superfluous water should be smoothed off the gelatine surface with the finger. If quicker drying is desired, the prints are laid singly on a sheet of glass, a piece of paper laid over them and superfluous moisture removed by passing a squeegee over them.

The exclusion of dust is a matter of greater importance than in the case of negatives, and drying under cover deserves to be more widely practised than it is.

Any good sized box, tightly jointed—or if not, covered outside with stout paper—and provided with shelves, makes a suitable drying place. The front should be a frame, fitting well into the box against half-inch strips of wood nailed round the inside, covered with calico or muslin. The shelves are covered with blotting-paper, which absorbs a good deal of the moisture, while the rest—when the box is placed in the open air (in fine weather) or near a fire—quickly disappears.

The use of methylated spirits, though not to be recommended as a usual practice, is sometimes useful when prints are wanted in a hurry. First squeegee the water-wet print, immerse in spirit, again squeegee, and after a second bath of spirit, dry at a gentle heat.—*The Amateur Photographer.*

Intensification and Reduction.

BY "LUDGIT HILL."

(1). One of the most valuable methods of adding density locally is that obtainable by the

"*Dusting-on*" *Powder Process.*—The outline of this process is as follows:—The *glass* side of a negative is coated all over with a somewhat sticky liquid mixture. This is dried and no longer sticky. The negative is then put in a printing frame or laid on a sheet of card and exposed to day-light, but the film side of the negative is outside, *i.e.*, towards the source of light. Light passing through the *thin* (shadows) part of the negative, acts upon the new coating; but the dense (high lights) parts of the negative stop the light, and here there is little or no action. The negative is now taken into a not too dry and dark room, *i.e.*, one from which daylight is excluded. After a while it is found that where light has acted the sticky mixture has lost its stickiness, but where light has not acted it attracts some moisture from the air and again becomes sticky. If now very finely-powdered black lead or other suitable material be lightly dusted on the coating, it adheres to the sticky parts, *i.e.*, parts under the high lights, but not to the light-acted upon parts. Hence density is added to the lights. Now the great point about this process is that is very largely under the control of the operator, for it largely rests with him where he shall add much or little dust. This he determines by allowing longer or shorter time in the damp dark-room for the stickiness returns not suddenly, but more or less slowly; so the longer he waits before dusting-on, the more sticky will be unaffected parts be. Again, in this way he can deal first with some parts and wait a little longer for others, so that he can not only localise, but vary the effect.

Now for practical details. Formulæ for mixtures of this kind are almost endless, yet essentially consist of three things, viz.; (1) Ammonium or potassium bichromate; (2) some form of colloid, glue, gelatine, etc., and (3), an adhesive—usually some form of sugar—*e.g.*, glucose, honey.

(2). We give two formulæ. Both are well supported and worthy of careful trial:

Albumen (white of egg)	½ oz.
Water	5 ,,
Glucose	½ ,,
Potassium bichromate ...	50 gr.

Put the white of egg in a bottle with water, and several small pieces of *clean* broken bits of glass, and shake well for some time. Then add the glucose, and when dissolved the bicromate. Finally, filter through a tuft of cotton wool or asbestos fibre. This mixture should be quite clear and limpid. It is flowed on and off the plate as though it were collodion. The plate is dried by holding over a hot plate or gas ring. The coating must be quite dry to the back of the hand, and just warm when put out to print. It should be laid on a sheet of India-rubber or celluloid. Printing may take one minute in sunshine. As to powder—the finest powder-plumbago is the most convenient. As to time of waiting in the damping room this depends on the state of the weather. Stickiness may begin to return in half a minute, or if the air be very dry, half an hour may have but little effect. Experience alone will be a guide in this, but to the beginner we may say it is better to begin dusting too soon than too late. If too soon, it only means waiting a little longer. The powder should be lightly dusted on with a very soft brush, and any non-adhering powder at once brushed off again.

(3). Here is a two-solution mixture:—*

A.—Lepage's liquid fish glue ...	1 part.
Glucose	4 parts.
Water	10 parts.
B.—Ammonium bichromate ...	1 part.
Water	10 parts.

For use take equal parts of A and B, mix thoroughly, and filter. [**Note.*—This formula is marked in our note book as "tried and approved." Although no name is given,

yet we think—writing from memory only—it is due to Mr. Ethelbret Henry, a worker who has made this subject his special study.]

The reader may find the follwing plan a convenient one. Obtain a good sized cardboard box, *e.g.*, such as is used by dressmakers. At each end (inside) put a small saucer with a small piece of damp, but not wet, sponge. Lay your printed plate film side down (coated side up) on a piece of stout glass placed in the middle of the box, *i.e.*, midway between the damp sponges. This forms a convenient damping box.

(4). *Backing Methods.*—These essentially consist in covering the glass side of the negative with thin paper —tissue, paper mineral, etc.,—tracing cloth, or the like and darkening parts of the paper where density is required. We may use *pen and ink* for fine lines, *brush and colour* for small patches, *stump* and powderd *chalk* for broad masses. But practically in any case, seeing that we have a practical thickness of glass between our intensification and the printing surface, there is sure to be some softening of edges. This softening may be increased by printing in diffused light, and reduced by printing in direct sun, or by placing the printing frame in a room far from the window, or at the bottom of a deep box with darkened sides.

LOCAL REDUCTION.

(5). Parts of the paper may be rendered more transparent by the local application of such things as fairly strong gum water, or Canada balsam dissolved in turpentine, benzole, or chloroform ; glycerine and vaseline may also be used for broad and soft patches.

(6). Local reduction may be brought about in an indirect way thus: The entire negative is stained red-brown by the uranium intensifier, and the parts to be reduced are decolourised by the local application of dilute ammonia.

(7). Again, what has been said in par. 152 here applies, *i.e.*: by thickening our reducing solutions with gum or glycerine we may brush them on locally.

(8). One very valuable method may be mentioned.

Take Potassium cyanide	...	10 gr.
Water	...	60 min.

Apply this to the negative (previously soaked but surface dried) with a brush. This requires skilful handling, and the beginner is advised to experiment with a few spare negatives. As soon as sufficient action has taken place, place under the tap and wash in a gentle stream. (N.B.—Pot. cyanide is a dangerous poison and should be kept under lock and key.)—*The Amateur Photographer.*

How a Lens is Made.

BY T. PERKINS.

Not one in a hundred of those who use lenses has any idea of the process of making them ; possibly many imagine that they are turned out by machinery like steel pens and bone buttons, but instead of this they are hand made, although, of course, grinding and other tools are used, and these are driven by steam, gas, or electric power. The workings of a photographic lens does not indeed of necessity require such absolute accuracy as the figuring of a telescopic objective, which must bring the various rays to a focus with such precision that the image formed by them may bear magnifying many hundreds of diameters; yet the figuring of photographic objectives has difficulties peculiar to itself. In the object glass of an astronomical telescope only a very limited angle of view is utilized, for though the lens would form an image of all objects in front of it included within a wide angle, yet the sides of the telescope tube receive most of the rays that would form these images, and only a small bundle of rays, all parallel to the axis, find their way after refraction to the eyepiece that magnifies the image of the sun, moon, planet, or star that is being observed. But in the photographic lens, rays making a considerable angle with the axis have to be taken account of, and the lens must be brought to such a point of perfection that these may form well-defined images. Some classes of lenses require much more individual treatment than others, the modern anastigmats among these. A slight variation in the glass, or in the thickness will make in these highly sensitive combinations an enormous difference, so that two lenses may be ground and polished on the same tools, and yet their performances may be widely different. Possibly the methods of working in the factories of different opticians vary in trifling details, but the process I intend to briefly and in general terms describe is that which I have seen adopted in the workshops of an English optician, who turns out work that will hold its own against that of any other maker of lenses in the world.

The plates of glass as they come from Jena or from one of the other glass factories, are rough upon their upper and under surfaces, but have been polished on opposite edges in order that the glass may be examined for freedom from striæ, unequal density, or any other defect. A plate of glass of the kind having the refractive index and dispersive power required for some special lens of the combination is taken, and by means of a diamond cut into squares of the needed size. These pieces are then handed over to one of the workmen, who with a pair of shanks—an instrument somewhat resembling a pair of scissors from which the blades have been removed—proceeds to reduce the squares to circles by pinching and crushing off the corners, and all that lies outside the circle. After this has been done the disc is ground to a more exact circle by holding it against a rotating grinding wheel in a lathe, or if it be of small size, it may be turned to a circle by means of steel tools. Next comes the process of rough grinding on an iron tool, fed with moist emery powder, the disc being held against it by the hand by means of a little handle connected to the back of the glass with pitch. This gives the lens that is to be the correct curve, approximate that is, on one side, the other is then rough ground in the same way, the disc having been removed from the handle which is then cemented to its opposite side. The next process is smooth grinding on brass tools supplied with emery. These tools revolve rapidly, driven by everlasting bands attached to the shafts running through the workshop, themselves driven by the engine; the tools used for grinding the convex surface are in the shape of hollow spherical cups ; those for grinding the concave surfaces are in the shape of a hemispherical bowl turned upside down. The curvature of the tools is, of course, spherical, and equal in radius to the desired radius of the surface curve of the lens. Next comes the polishing. This is done on tools made of composition, wax and pitch ; emery powder is no longer used, its place being taken by rouge. In grinding the deep interior curves of the surfaces to be cemented together, each lens has to be worked singly, but when the shallow outside curves are being

worked, half a dozen lenses, if small, can be ground or polished at once, these all being embedded in pitch moulded to the same curve as that of the polishing tool, and attached by the back to a handle.

When the lens is finally polished, it must be centred. The method of centring is very ingenious. The lens is fastened by pitch to a disc rotating vertically, with its axis as nearly as possible coincident with the axis of rotation. A small jet of gas is kept burning below it so that the pitch may remain viscid, and the lens may be moved if needful, parallel to the face of the revolving support. A lighted candle is placed in front of the lens a little to one side of the axis, and its images reflected from the surfaces of the lens are observed; at first, as the lens spins round, these will in all probability be seen to "wobble" considerably, for the lens probably has not been placed so that its optical axis is absolutely coincident with the axis of rotation. The optician, from skill acquired by long practice, knows in which direction the lens must be slipped, he catches as it were the image as it rises or falls, stops the rotation by a touch of his hand, and then presses the lens at the edge, making it slide a short distance on the face of the rotating disc; the wobbling is now less, but the optician does not rest satisfied till the reflected images of the flame are as steady while the lens is rotating, as though it were at rest. When this is the case he turns out the gas jet, and allows the pitch to harden, so that the lens may be firmly held during the next process, that of edging. It will be noticed that now that the lens is spinning truly about its axis, every point on its edge should be at the same distance from the centre of rotation, but this is probably not the case in its present condition, and it will be necessary to grind off the protruding parts of its edge. Were a tool firmly fixed to be brought against the edge of the lens as it spins, it would be liable to break it or to jerk it off its support, so that edging is done carefully by bringing a curved sheet of copper, held lightly in the hand, against the edge of the lens, while an assistant drops damp emery powder on the edge of the lens; thus the irregular prominences are first taken off and as the lens is reduced more and more nearly to a circular form, the sheet of copper is pressed more firmly against the edge of the lens, and the process is continued until it is seen that the copper has ground the edge all round. Thus one element of our component of the complete lens is finished; but in lenses generally used for photographic purposes, even in the so-called *single* landscape, there are really two or more simple lenses cemented together. Each of these is centred and edged separately. Then comes the cementing, the lens with a concave face is laid down with its concavity upwards, a drop of warm Canada balsam is dropped on it, and the convex surface of the other lens pressed upon it. But it is almost impossible so to place this that the two axes may coincide, hence further centring has to be done. The lens with the thickest edge is fastened in the chuck of a lathe, the Canada balsam prevented from setting by a small gas flame lighted below it; and then the lathe is worked. The compound lens spins round, and as the lens attached to the lathe is bound to spin correctly about the axis, the images of a lighted candle reflected from the two surfaces of this are sure to be steady; not so those produced by the surfaces of the lens only held to the other by the cement. This lens can, however, be shifted a little on the other, since the cement is not hard, and it is so shifted in much the same manner as has been described above, until the optician is satisfied that all is as it should be in this respect; the gas is then turned out, the cement allowed to harden and the lens edged, generally with a file held in the hand, for now there is little or no glass to take off, only sufficient to make the two lenses of the same size and to make them fit the cell. If a third element has to be added, as in the case of some single lenses, and always in the case of the modern anastigmats, the first two already centred are securely fastened in a cell, the third cemented to them, and this can be adjusted by the means already described. When the lenses are small the alteration of the position of the lenses in centring is done by means of a small peg of hard wood similar to that used by watchmakers.

The lens being, as it is hoped, optically finished, it is then put into the testing tube and tested for the various aberrations, and is generally also practically tested in the camera by the exposure of a plate. If found satisfactory it is put into the tube in which it is to be sent out from the factory, and finished off neatly, the glasses burnished into the cells, etc.

But, it may be asked, how, when each component of a doublet is completed, can we be sure that the two components, when screwed one into one end, the other into the other of the body tube, have their axes absolutely coincident? This depends on the accuracy of the brass work; if the cells are truly centred, and the tube is also turned true, the two components must be in adjustment. It may, however, happen that the lens may, when it is tested, not be found quite free from aberrations, especially if it be one of those modern anastigmats which in the last chapter I said were peculiarly sensitive. In this case it may be necessary to uncement the simple elements and slightly alter the figure of some of the glasses. This involves more labour and more time.

There is a good deal of delicate mechanical work also required in the manufacture of the iris diaphragms, composed as they are of many leaves of thin metal fastened at one end by rivets to a fixed ring inside the cell, and at the other in a similar way to the ring which the photographer turns round to set the aperture according to his requirements. The leaves of the iris are blackened chemically, the interior of the tube and the cells by means of dead black, applied with a brush to the tube kept warm and spinning in the lathe. The lacquer on the outside is also applied in a similar way.

The reader who has carefully followed the description, I have given of the way in which a photographic lens is made by a high-class optician will understand how the price at which such instruments are sold must always be comparatively high; for such an optician has a pride in his work, and will not send a lens from his factory unless it is as perfect optically as he can make it, and mounted in well-finished brass work. He never says "That is good enough for the man into whose hands it may come." How is it then that lenses at much lower prices are to be purchased? Simply because much less care is bestowed upon their manufacture; they are often made, not by skilled hands, but by boys and apprentices whose labour is less highly paid; they are sometimes imperfectly polished, brown paper being often used as a polishing agent, the centring is done roughly, and frequently to give them an appearance of giving better definition than they really will give, the stops are purposely falsely marked so that the photographer who uses them says, "With this cheap lens I get, using the same relative sized stop, as good or almost as good definition as with the higher priced instrument." But his cheap lens which he imagines he is using at $f/11$, is really, though he does not know it, stopped down to $f/16$ or $f/20$.

It is quite true that much good pictorial work has been done with cheap uncorrected single lenses, or even without a lens at all, but occasions frequently occur when one requires all the definition a high-class lens will give, and much finer results are obtainable with a lens of high class working at a large aperture, than with an inferior one greatly stopped down to secure equally sharp definition: for we often wish to obtain fine definition in one plane while objects on others are softened more or less; this a good lens will do with a large aperture, but a poor lens, if stopped down enough to give good definition in one plane, will, on account of its small effective aperture, give as equally sharp definition where we do not want it. Hence it is well, if we can afford it, to purchase instruments that give us, according to the way in which we use them, every power we can possibly need.—*The Practical Photographer.*

The Problem of the Developable Photographic Image.

BY COLONEL J. WATERHOUSE, I.S.C.

WITHOUT going deeply into the theory of the invisible photographic image as Capt. Abney and Mr. Chapman Jones have done, I venture to bring forward a few facts and considerations which may help to throw light upon the vexed question of the physical or chemical nature of what is commonly called the "latent image."

First, I may note a tendency in the present day to refer all such questions to the ordinary gelatine dry plate. This is no doubt convenient, because the plates, being easily obtainable ready prepared, are in universal use for all photographic purposes, and the lessons they can teach us are more or less applicable to other sensitive photographic surfaces containing combinations of silver haloids. At the same time the question is a many-sided one to be attacked in various different ways, and the teaching of some of the earlier and now almost obsolete processes should not be lost sight of.

That we really have an exceedingly difficult problem to solve is sufficiently shown by the fact that, after sixty years of careful and constant investigation and research by the best and foremost chemists and workers in photography in this and other countries, we seem almost

As far off as ever from a Satisfactory Solution

of it. This difficulty, it must be confessed, is not without its advantages in maintaining a continuous striving and effort to get at the secret of the mysterious action that forms the basis of all our photographic processes in which the haloid salts of silver take part.

During the sixty years that have elapsed since these salts were first used to produce an invisible, but developable, image, an immense number of valuable observations of the phenomenon under different conditions have been recorded, and many more or less possible theories have been put forward to explain it. It is, nevertheless, very difficult for a worker of the present day to find any concise and systematic statement of what is known about the question, and of the efforts that have been made to solve it. The information available is scattered through periodicals and journals and a few text books. It seems, however, very desirable that some effort should be made to bring together and classify the important work already done. The treatises of H. W. Vogel and Eder in German, and Fabre in French, supply this want to a great extent, but are not very accessible to English readers.

Briefly stated, the claims of the adherents of the chemical theory are, that the haloid salts of silver are chemically decomposed by the action of light, the halogen being set free, or combining with any suitable organic or metallic absorbent present, sub-haloid salts being formed. This is the theory which on various grounds is generally adopted, more especially as regards the haloid compounds usually found in gelatine emulsions or dry plates.

Another view, put forward by some advocates of a chemical theory, is that the action of light produces

A Minute Quantity of reduced Metallic Silver,

upon which as a nucleus the image grows under the action of the developer, either by simple molecular attraction, or by electrolytic action.

On the other hand, the advocates of the physical theory claim that no chemical decomposition takes place at first, at any rate, but that the disturbance set up by the action of light causes the bromide to assume an allotropic state, which, although causing no change in its appearance or chemical composition, renders it more readily capable of reduction by the developer.

It must be remembered, however, that no chemical change can take place without some accompanying physical action, and, even supposing that the composition of the altered silver haloid remains the same as before, if the result of physical action is to produce a substance having distinctly different chemical properties, the process by which this result is obtained must be considered a chemical one, or, at any rate, a physico-chemical one.

As Mr. Chapman Jones remarks, the first action of light must necessarily be physical. To what extent it may or may not be directly connected with the electric or magnetic theory of light, as propounded by Clerk Maxwell, is an open question, but that there is a connection is shown by the very early work of Becquerel and Aobert Hunt with electric actinometers, as well as by the later researches in the same direction of Minchin, Abney, Rigollot, and others, and, perhaps, most clearly and definitely by Röntgen's discovery of the action of the X-rays, and the researches by various physicists on the action of ultra-violet light in connection with electrical discharges, and conductivity.

Becquerel showed that the effect of light falling upon coatings of silver iodide, chloride, or bromide on silver plates immersed in a suitable conducting fluid, one plate being exposed to light and the other not, was

To Generate an Electrical Current

of which the force and amount are capable of being measured and estimated by the ordinary methods of electrical measurement. Minchin has been able in a somewhat similar manner to cause the light of a distant star to generate an electrical current, which could in the same way be measured and compared with the light of other stars, or of the sun or any other source of illumination. I have at present under observation an electrical actinometer on Rigollot's principle, which shows that the power of the light of a candle about six inches away is about ·003 of a volt, and dull daylight about the same, or even less.

The action of electrical currents must, however, be accompanied by chemical decomposition, and *vice versâ*, and which is the cause and which is the effect is, I believe, still a disputed point. If, in the case of the photographic plate it can be shown that the chemical decomposition of the exposed parts of the film is direct

result of an electric or magnetic action of light it would go far to solve our problem from the physical side.

That the question is worthy of consideration from this point of view may be gathered from the following extract from the English translation of Nernst's "Theoretical Chemistry," page 626. Under the subheading of "The Theory of Photochemical Action," the author says:

"Thus far only vague surmises have been expressed regarding that *mechanism* by dint of which the energy of the vibrations of the luminiferous ether is applied to the performance of chemical work. But in consideration of the fact that in the sense of the later views the light vibrations are produced by electric agitations, therefore it is an immediate inference to suppose that in the chemical action of light we are dealing with phenomena which are not far removed from the formation and decomposition of chemical compounds under the influence of the galvanic current. But it is possible that the time to advance from this standpoint to hypotheses of a special nature will not arrive until our views regarding the mechanics of the light process shall have become clearer themselves, and also shall have been worked out with more completeness."

I have myself thought for some years past that it is in this direction that we must look for further light, because if we can once establish a good

Connection between Photochemical and Electrochemical

action, we get at once into touch with a means of exact measurement of force by which the physical or chemical action of light can be compared with physical or chemical actions produced by other agencies.

As I demonstrated some years ago, it is quite easy to show and measure with the aid of a galvanometer the reversal of the electrical current generated during the development and reversal of an over-exposed ordinary dry plate film. As the normal development proceeded the needle advanced, and as reversal set in and progressed it receded.

Another strong point on the physical side, brought forward by Mr. Chapman Jones, is the fact, first drawn attention to by the late Carey Lea, that photographic plates are very sensitive to the mechanical effects of friction, pressure, or shearing stress, even so slight as the touch of a smooth glass rod. This fact at any rate shows that the developable condition of the silver haloids can be brought about by mechanical means on the photographic plate without the aid of light. The nature of the chemical change thus produced does not seem to have been clearly ascertained, but there can be little doubt from Captain Abney's researches on this subject that there is a chemical change caused by shearing stress, and that it is not a mere case of allotropism or of mechanical action on the gelatine.

Leaper took some silver iodide and subjected it while moist with silver nitrate to the pressure of three tons on the square inch for three months without it changing colour in the least, though it darkened under the developer.

Carey Lea, in a very interesting paper on "The Disruption of the Silver Haloid Molecule by Mechanical Force" (*Am. Jnl. Phot.* 1892, page 344), has shown that under a pressure of about forty-four tons to the square inch the chloride, bromide, and iodide all darkened within twenty-four hours, the colour being a deep greenish back. Further, he triturated the pure chloride and bromide in a mortar, and after about twenty minutes' grinding succeeded in darkening them, the colour being in both cases a purplish-chocolate, very different from the greenish-black obtained in the last experiments.

I have been able to darken silver chloride in the same way by trituration in a mortar, and obtained a similar reddish chocolate tint. The bromide and iodide proved more refractory, but it was found that after trituration they were all readily darkened by an ordinary pyro developer.

It was further found that impure forms of the haloid salts themselves could be prepared in the same *mechanical* or *physical* way by rubbing together in a glass mortar *dry* silver nitrate and potassium bromide, or iodide, or sodium chloride. With these forms of haloids, however, a prolonged and stronger grinding did not produce any distinctly visible darkening, so that there is something more in the action of light than there is in the merely mechanical action though both produce a developable form of silver haloid. The fact that physical or mechanical action will bring about chemical combination is well known, and in the case of some very unstable compounds, the lightest touch of a feature is sufficient to bring about chemical decomposition, often of a very violent character. Carey Lea notes that these decompositions, being exothermic, have nothing in common with the endothermic decompositions of silver haloids. The very fact that such an utterly intangible excitant as a ray of light, even of the faintest character, can so readily bring about the decomposition of the surface of a highly sensitive photographic plate is of itself sufficient proof that the

Silver Haloids are very Unstable Compounds

under certain conditions, and we may well expect that they would be decomposed by mechanical pressure, or shearing stress, and other forms of physical energy, though this result cannot, I think, be taken as a proof of a purely physical action of light *per se*.

I fear this paper has already exceeded its limits, so that I can only deal very briefly with the other side of the question. First, as to the *visible* image. It is often argued that, because we cannot see an image, as the result of the action of light on our sensitive plates, there is no such image. I am inclined to think that it is the other way about—there is an image, but we cannot see it. In many of the old dry-plate processes it was quite common to have a visible image before developing, and that without any over-exposure. During my experiments with doguerreotype last year, I noticed constantly that the image was visible on the plate after exposure and could be made more so by breathing upon it. In fact, I used this appearance as a test whether the image would develop. If I could not see it by breathing on it, I did not get much result from developing.

Again, in many of the collochromate processes with gelatine, although the action of light may not be visible, its effect upon the gelatine can at once be seen by placing the film in water.

We know that developable states of the silver haloids on a photographic plate can be produced by all forms of energy as well as by purely chemical and electrolytic methods. The question, therefore, is to ascertain if the reduction product in all cases is the same as that produced by light, and, if so, whether it will be possible to produce it by any one of those agencies in sufficient quantities to admit of its being tested by the ordinary methods of chemical analysis, and its composition definitely determined.

Dr. Russell's recent researches on the action of various substances in producing a developable image on gelatine dry plates, which he attributes to the action of peroxide of hydrogen, show that this developable condition of the silver haloids can also be produced by purely

chemical meals without the intervention of light. The fact that this result seems to be in all cases attributable to peroxide of hydrogen seems to me to open out a very interesting field of new enquiry as to whether this substances is formed during the action of light on the photographic plate, and how? Its presence would seem to point to a decomposition of the atmosphere under the influence of light, or other agencies capable of producing the developable image. It appears not impossible that the known

Highly Magnetic Properties of Oxygen

may be a factor in producing the light effect, especially if we can trace its origin to any physical, electric or magnetic action.

In conclusion, I think that in this, as in many other cases of chemical action resulting from physical causes, there is no hard and fast line between the physical and chemical actions of light on the photographic plate. They go together. It is a case of *l'union fait la force*, and we shall gain little by trying to separate them. The elucidation of the problem lies in the domain of physical chemistry, and more especially in the direction of photochemical and electrochemical research. The new evidence of other distinctly physical and chemical forms of action, the X-rays and the action of peroxide of hydrogen, being able to produce the same effects on a photographic plate as light, should, if followed out, be able to advance our knowledge of this complicated question very materially.—*Journal of the Photographic Society of India.*

Acetylene.

By Professor Vivian B. Lewis.

It was in 1836 that Edmund Davy, the nephew of the great Sir Humphry Davy, read before the Dublin Royal Society a paper which in the light of to-day was a remarkable prediction. In that paper he pointed out that while he had been trying to make potassium by distilling tartrate of potassium he got a residue left behind which when thrown into water evolved a gas which on analysis proved to be a bicarburet of hydrogen. He went on to refer to the properties of this gas, and concluded his paper by showing its marvellous illuminating power and prognosticating that some day it would play a very important part in lighting work. When we read Davy's paper we find that we have really made but little advance since his day, and the facts which he put forward would be as good an epitome as could be got of the characteristics and properties of acetylene. What has been done since has really been to fill in some of the blanks in its character and history, and to bring it from a purely experimental to a commercial basis. After Davy's time many experiments were made and new facts discovered, and by 1859 one had a very minute knowledge of many of the properties of acetylene, because certain characteristics had cropped up which were of such great interest that they had led to a large amount of study being given to the subject. In 1859 Berthelot set to work to make experiments upon it which gradually worked themselves up into a research of very great beauty; and it was Berthelot who showed that amongst the many characteristics of interest with regard to acetylene it had one of paramount importance from a theoretical standpoint, and that was that it could be really built up from its constituents,—that acetylene could be made from carbon and hydrogen by burning the carbon in the electric are in an atmosphere of hydrogen. After Berthelot had done this work, in 1862, came the discovery by a great German chemist Wöhler, that calcium carbide could be made, and that this body could be decomposed by water with the evolution of acetylene. Wöhler made calcic carbide, by making an amalgam of zinc and calcium, and causing it to combine with carbon, when the zinc distilled off and the calcic carbide remained.

All these experiments were of a purely scientific character, and no idea of acetylene ever being a commercial product arose until 1892, and that year saw the conversion of the previous knowledge to a commercial basis. It was in 1892 that two men, one in France and one in Canada, were at work upon the electric furnace. In France, M. Moissan, that king of experimentalists, discovered how to make calcic carbide directly from lime and charcoal in the electric furnace—discovered it as a step in one of the most beautiful researches ever made,—discovered it as a sequence to a number of other well-considered steps. On the other hand, in America, a Canadian engineer, named Wilson, came upon this discovery quite by chance; and there is no doubt that although everybody would be glad to give Moissan the credit, he only made his discovery in time to find that the Canadian worker had quite by chance forestalled him.

The electric furnace is the factor which had made acetylene a possibility, and it was Sir Humpby Davy himself who at the Royal Institution first of all showed the light and heat which the electric arc was capable of generating. After Davy's time, attempts had been made to utilise the wonderful heating power of the arc, but it was not until 1879, I think, that Siemens first of all made what was really a practical electric furnace, and soon afterwards Cowles, and others began to make what may be called commercial electric furnaces, Cowles especially making them for the purposes of producing aluminium from alumuna. Wilson, who was interested in engineering work, had command of water power at Spray, in North Pennsylvania, and he set up some turbines and a dynamo, and put up an electric furnace very much of the Cowles type to try to make aluminium by a process which should slightly differ from Cowles' process, with the idea that if he could fuse togother copper and alumina he might be able to get the copper and aluminium to combine and from brooze. Unfortunately, the idea did not turn out to be a commercial success, and Wilson tried then if he could by getting a metal which had a strong reducing power get something which would better get the oxygen away from the alumina. He tried to get the metal calcium from lime by reducing it with carbon, and in doing this he found that he had a semi-mettallic looking mass formed, which he at first hoped was calcum; when he begun to experiment with this substance, however, he soon ascertained that it was not calcium, and he threw it into the stream which was turning his turbine. He then noticed an enormous evolution of gas, together with a smell that commanded attention, and came to the conclusion that here was something which ought to be further investigated; and having got a Mr. Venables to work with him, he found that the substance was calcic carbide and that the gas was acetylene. This was early in 1892, and in the middle of that year he privately sent specimens of calcic carbide to friends in America, and also to Lord Kelvin. Moissan's discovery was published in December, 1892, so it is quite clear that Wilson was well ahead of Moissan, which indeed, I believe, Moissan admits.

(*To be continued*).

COMPETITIONS.

(Open only to Members of the Society.)

HALF YEARLY ... **Architecture.**

RULES.

1. *Two Special Competitions shall be held, in each year, in addition to a monthly competition.*

2. *The Committee shall select the subjects for the Special Competitions, and notice of the selected subjects shall be announced in the Society's Journal in February and in July of each year. The subject for each monthly competition shall be selected two months in advance by the members present at the monthly meeting, and shall be notified in the next issue of the Society's Journal.*

3. *Pictures, &c., competing for Prizes at the Special Competitions must reach the Secretary by the last day of January and of May, and those competing at the monthly competitions must arrive in time to be shown at the monthly meeting.*

4. *Prizes will consist of Silver and of Bronze Medals, and of Certificates of Merit.*

5. *Not more than one Silver and one Bronze Medal shall be given at each Special Competition, and one Silver and one Bronze Medal may also be given at these competitions for excellence in copying, enlarging, lantern slides, or any other special branch of photography. One Silver and one Bronze Medal shall be awarded half-yearly to the exhibitors who obtain the highest and the next highest marks respectively at the monthly competitions. The number of Certificates of Merit granted at each competition is left to the discretion of the Judges.*

6. *A member may receive only one Silver and one Bronze Medal in the special, and one Silver and one Bronze Medal in the monthly, competitions, held during the same year; but should a member who has been adjudged a medal be disqualified under this rule from receiving it, he shall be given a Special Certificate instead, marked 1st or 2nd Prize.*

7. *A Special Committee of three members shall be appointed Judges by the General Committee to carry out, subject to these Rules, all arrangements connected with the competitions.*

8. *The Special Committee shall be appointed after the Annual General Meeting in January, and shall hold office for one year, and any vacancy occurring will be filled up by the General Committee.*

9. *The Special Committee shall decide upon the merits of the pictures, &c., sent in for competition, and their decision shall be final. The system of judging the monthly exhibits shall be by awarding marks, a record of which shall be kept by the Judges, the marks being totalled and the results declared half-yearly. For this purpose, only the three highest marks awarded at each competition to each competitor shall be recorded, but not the aggregate marks gained by each for a number of exhibits.*

10. *If any member of the Special Committee is a competitor, the General Committee shall appoint a non-competing member to act as Judge at that competition instead of the competing member.*

11. *No exhibit shall compete twice, but pictures, &c., already exhibited elsewhere, may be sent in for the competitions.*

12. *Lantern slides sent in for competition shall be in sets of six, and shall be judged upon the screen.*

13. *The Special Committee shall not award any Prizes or Certificates, unless they consider the exhibits to be worthy of such distinction.*

14. *Each competing exhibit shall be the entire work of the exhibitor, and when sent in shall be accompanied by a Certificate in the annexed form:—*

> *"The (1) Arranging, (2) Exposing, (3) Developing, (4) Retouching (if any), (5) Printing and (6) Trimming and Mounting were done by me without assistance."*
>
> ______________________
>
> *Member, A. P. Socy. of Madras.*

15. *All pictures for the Special Competitions shall be mounted, and may, at the competitor's option, be framed but not glazed. Those for the monthly competitions need not be mounted, but should be trimmed.*

16. *Each competing picture should have a name or title, which should indicate the nature of the subject.*

17. *No competitor shall be allowed to send in more than six pictures to compete for any particular Prize, but the same member may compete in all branches specified in Rule 5.*

18. *The pictures gaining 1st and 2nd Prizes at the half-yearly competitions, and the best pictures sent for the monthly competitions, shall, when practicable, be reproduced in the Society's Journal.*

19. *To give up-country members an opportunity of seeing the competing pictures at the special competitions, the pictures shall be circulated to all members of the Society, not residing in Madras, who apply to see them. As this arrangement can only be carried out by the cordial co-operation of the members themselves, they are expected to forward the pictures without delay to the next member, and to send one of the accompanying post-cards to the Secretary, so that by this means the progress of the pictures may be traced.*

List of Members whose Dark Rooms are available for use by Members of the Madras Amateur Photographic Society.

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